



**Industry &
Investment**

Investigation Report

Incident involving
Bruce Slessor

Cadia Valley Operations
South Waste Dump Extension

24 August 2008

Report prepared for the Director General of
the Department of Industry and Investment
by the Investigation Unit, Thornton

Report Date: July 2010

Mine Safety Investigation Unit

Title: Investigation Report – Bruce Slessor incident on 24 August 2008

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of Industry and Investment NSW or the user's independent advisor.

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Introduction

Aim of this report	<p>This is the report of the investigation into an incident that took place at about 5:00pm on Sunday 24 August 2008 at the Cadia Valley Operations (CVO), South Waste Dump extension area. CVO is located 25kms south of Orange in central NSW.</p> <p>In the incident Bruce Slessor, an employee of Newcrest Mining Limited (NML), received serious head injuries when struck by the root ball end of a tree log that was being levered out from a pile of felled scrub timber by a backhoe bucket.</p> <p>This report aims to provide details of the investigation into the incident, set out findings from the investigation and to also provide the Director General with information to help the mining industry identify hazards in their workplace and to establish risk controls to avoid a similar incident.</p>
The investigation unit	<p>The Investigation Unit has been established to investigate serious mine incidents and report directly to the Director General of Department of Industry and Investment. The Investigation Unit is independent of Mine Safety Operations.</p> <p>The incident was assessed under relevant policy of the Department of Industry and Investment (referred to as Industry and Investment NSW) and identified as an appropriate incident for a major investigation carried out by the Investigation Unit.</p>
The investigator	<p>The Industry and Investment NSW investigation was led by Tony Smith, Senior Investigator with the Unit.</p>
Conclusions are evidence based	<p>Observations and conclusions provided in this report are based on the evidence and findings identified in the course of the detailed investigation conducted into the incident.</p>
The company	<p>NML is Australia's largest gold producer. Its activities include five operating mines in Australia, one in Indonesia and one in Papua New Guinea.</p> <p>NML owns 100% of CVO, comprising mining operations named Cadia Hill Open Cut Mine, Ridgeway Underground Mine and Cadia East Underground Mine.</p> <p>For 2008-09 Newcrest reported production of 532,000 ounces of gold and 57,000 tonnes of copper from CVO.</p>

The mine

Cadia Hill Mine is an open cut mine which commenced in 1998 and has a forecast mine life to 2013. The open cut is currently at approximately 500m in depth and extracts ore using truck and hydraulic excavator equipment. Expansion of the Cadia East Underground has commenced for future long term ore production.

Processing of the ore from the mining operations takes place on site at CVO, with the waste rock transported by truck to large rock dumps. Processing waste water and small rock particles are pumped to the tailings dam on the CVO site.

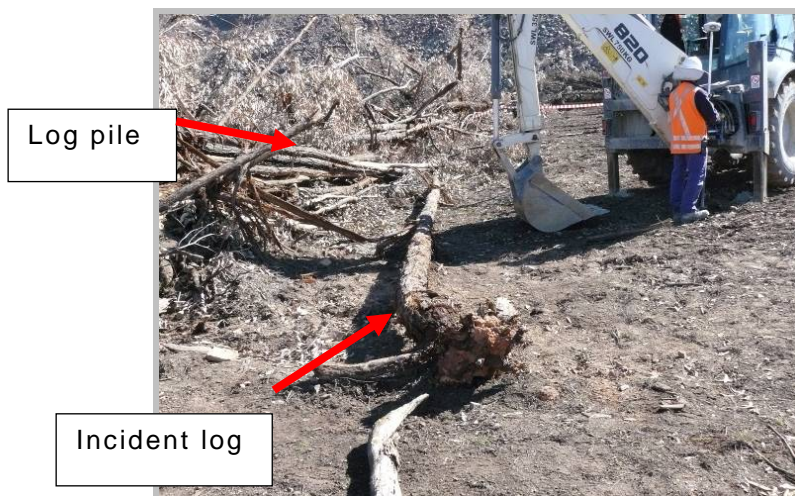
The incident was located in an area of the mining lease that had been clear felled of bush timber vegetation in May 2008 and bulldozed into large stockpile windrows to allow for expansion of the waste rock dump.

The incident

The task

At the time of the incident Bruce Slessor was recovering timber logs from piles of felled bush timber that had previously been formed by a bulldozer. The recovery method involved the use of a backhoe excavator bucket to lever a log from the timber pile.

Mr Slessor was in the operating zone of the backhoe at the time the backhoe operator was levering out a timber log with the bucket of the machine. The log sprang from the pile and struck Mr Slessor in the head.



This photo shows the root ball of the incident log on the ground in front of the backhoe and the timber pile.

Person in the photo taking measurements post the incident

Photo date 26/8/08

Time of the incident

The incident involving Bruce Slessor occurred at approximately 5:00pm on Sunday 24 August 2008.

Mr Slessor had started work at 6:00 am on the same day, and had been at work for about 11 hours of a 12 hour shift.

Eye-witness to the incident

The back hoe operator was the only eye-witness to the incident and assisted with the investigation.

The incident victim

Bruce Slessor The victim of the incident was Bruce Slessor, 48 years of age. Mr Slessor had been an employee of Newcrest Mining Limited since December 2001 and was trained to operate various mining equipment, including a chainsaw for the mine services crew at CVO.

Mr Slessor was not authorised to operate the backhoe machine involved in the incident. However, he was authorised to operate a variety of mining equipment including an excavator and front end loader which are larger in size than the incident backhoe..

The injuries received Mr Slessor was transported by helicopter to Westmead Hospital near Sydney on the evening of Sunday 24 August 2008. Initial medical assessment records identified a severe skull injury and not likely to survive long term.

Further medical diagnosis identified that Mr Slessor had 32 skull fractures and loss of sight in one eye.

Mr Slessor remained in the Westmead Brain Injury Unit for over a year. A medical assessment provided in January 2009 indicated that Mr Slessor will require long term specialist nursing hospitalisation care. Mr Slessor at the date of this report is located in a nursing facility in central NSW.

The investigation

Investigation activities The investigation involved a number of activities, including:

- Visit to the incident scene by Industry and Investment Inspectors and NSW Police.
- Testing of the operational status of the backhoe involved in the incident both at the scene and later by the original equipment supplier.
- Obtaining information from site personnel
- Collection by OHS 2000 notice of CVO safety systems documentation
- Review of the CVO safe work procedures for the task
- Review of the training systems for CVO employees of the CVO safe work procedures

The circumstances

The mine waste dumps

The South Waste Dump was originally designed to be built and expand from west to the east and then expand northwards.

As CVO explored and drilled the new Cadia East Underground Mine ore body it was identified that expanding the waste dumps to the north would cause interaction between the subsidence zone of the underground mine and the South Waste Dump.

CVO obtained State planning variation to approvals to clear timber to the south of the South Waste Dump so the dump could be expanded even further south than originally designed.

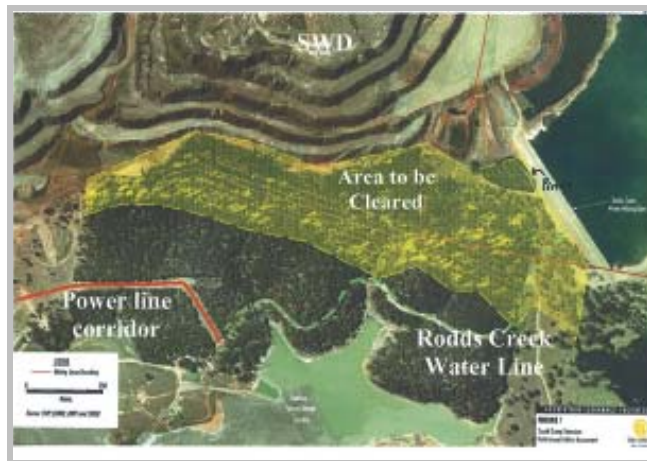
Removing vegetation and stockpiling timber

The area referred to by CVO as the South Waste Dump Extension had been clear felled of the remnant bush vegetation by a specialist timber salvage contractor in late May 2008.

CVO provided documents of risk assessments for this activity specifically created for the external timber salvage contractor.

The risk assessments identified the potential for injury to people as a result of falling tree limbs and human-machine interactions.

The non salvageable timber was stockpiled on site into windrows. It was intended ultimately to be covered by the advancing face of the south waste dump.



This diagram shows the area cleared in May 2008 below the South Waste Dump and Rodds Creek Dam.

Digging test holes in the cleared area

CVO mine services crews were permitted to work in the south waste dump cleared area to dig test holes into the exposed ground.

The test hole task was to measure the depth of topsoil and if a reasonable depth was found it was intended to reclaim the topsoil with a scraper for later use in CVO site rehabilitation.

The second purpose of the test holes was to measure clay depth as the waste rock to be placed over the reclaimed area had the potential to form acid leachate. The clay would provide a barrier from the waste rock and the local water table.

Excavation permit required	CVO procedures required that any hole dug deeper than 300mm required an excavation permit and formal authorisation.
Initial 'See Stop Control' assessment	<p>A CVO employee began digging test holes on 24 July 2008 in the area and he completed a 'See Stop Control' (SSC) assessment form.</p> <p>The CVO definition of an SSC- <i>"a process employed to determine the future risk potential for a task including escalation to a job safety and environmental analysis (JSEA) where the task cannot be safely managed under a SSC. Also used to manage changed conditions prior to and throughout the performance of a task under JSEA or safe work procedure"</i>.</p>
No further assessments undertaken	<p>No other 'See Stop Control' forms for digging test holes were created for the task after the SSC was completed on 24 July 2008.</p> <p>No excavation permit was created for digging the test holes even though the holes were likely to be greater than 300mm in depth.</p> <p>Written instructions were given to the Mine Services Crews to dig test holes on seven occasions between 21 July 2008 and 24 August 2008.</p>
Permission given by immediate supervisor to take logs	<p>Mr Slessor's immediate supervisor said that Mr Slessor initially discussed with him about taking timber logs from the stock piles for Mr Slessor's personal use some four to six weeks before the incident.</p> <p>Mr Slessor asked a second time two weeks before the incident about accessing the timber piles when they were driving over the cleared area to plan location sites for the test holes.</p> <p>During this discussion the Supervisor gave verbal permission to Mr Slessor to collect timber logs when the test holes were being dug. The Supervisor believed he had authority to give permission to Mr Slessor to collect timber.</p> <p>The Supervisor did not discuss with any other supervisor at CVO Mr Slessor's request to collect timber logs for his own use.</p> <p>The task of collecting timber logs was not a task required by CVO of its employees.</p>
Approval to remove items from the site	CVO has a highly visible security system in place, including front gate security guards. There are random checks of vehicles leaving the site. CVO has a paper docket system which gives designated supervisors the authority to give permission for an individual to remove items from the site.
Supervisor did not have authority to sign docket	Mr Slessor's direct Supervisor did not have this authority. He required an authorised supervisor to sign the docket.

The Supervisor explained that the procedure required that the removal docket be signed on the actual day of removal of the item from CVO site. Therefore the intention was to stockpile the timber logs and obtain an authorising signature to remove them at a later date.

The system of docket and item removal was well established and other employees had removed timber waste, including wooden pallets

No records kept of logs being removed from the site

However, in a review of two years of relevant records no record was found listing bush timber for firewood being taken from site.

Other CVO employees told the Investigator that firewood had been cut at other locations at CVO before the incident and taken from site. In those instances the removal appears to have had only verbal approval and was given by another supervisor.

The Supervisor involved in Mr Slessor's incident said he had a discussion with Mr Slessor before the activity concerning the system of work of accessing and removing timber.

Supervisor believed logs were to be moved by hand

The Supervisor thought that the system of work to be used was to take timber logs from the wood piles only by hand. He believed there was sufficient timber easily accessible by hand without the need to pull apart the timber piles.

The Supervisor thought that the backhoe was only going to be used to transport the timber logs from the wood piles to another stockpile of extracted timber logs.

During the period of the investigation Mr Slessor was not able to provide his account of the events.

Collecting timber the day before the incident

Mr Slessor arrived at the electronic CVO front gate at 6:31am on Saturday 23 August 2008. This was the first day of his work roster cycle.

The mine services crew, including Mr Slessor, were allocated tasks for the day.

The work task of 'dig test holes for clay' in the incident area was listed on the daily plan task list for the mine services crew.

The Supervisor told the mine service crew backhoe operator to dig test holes in the incident area and to help Mr Slessor collect timber logs.

The backhoe operator said the Supervisor told him Mr Slessor knew what timber he wanted. No further discussion took place with the supervisor about the safe work method of the task of digging test holes or accessing the timber.

The backhoe operator said it was not unusual for a supervisor to issue work tasks verbally without discussing safety aspects for the task.

No written risk assessment

After 5:00 pm on the afternoon of Saturday 23 August 2008 Mr Slessor and the backhoe operator commenced access and cutting of the timber wood piles for logs.

This was the first occasion the backhoe operator was involved in the timber log collection process with Mr Slessor.

The backhoe operator said he discussed with Mr Slessor the work process to access and cut the timber. However there is no evidence that a CVO documented safety system "See, Stop, Control" form was created as a result of the task discussion.

Different work methods

The backhoe operator said that several different work methods were used to access, cut and remove the logs from the timber piles.

Two of the methods involved use of the backhoe bucket to access and move logs.

The backhoe bucket teeth were used to move logs around in the pile to gain access. The bucket was then put on the ground before Mr Slessor would walk into the backhoe work area and cut the log with a chain saw.

Mr Slessor had access to CVO chainsaws as part of his role with the Mine Service crew.

CVO had provided external training to Mr Slessor in the use of a chainsaw for cutting bush timber.

Another work method involved Mr Slessor attaching a sling to the backhoe bucket to pull logs from the pile to gain access.

The backhoe operator said he remained in the backhoe cabin while the chain saw was in use.

While Mr Slessor was in the work zone of the backhoe bucket, the bucket remained stationary and he recollects taking his hands off the controls of the bucket.

The backhoe operator said that Mr Slessor would move himself out of the bucket work zone whenever the bucket was being used. He said that Mr Slessor was outside of the reach of the bucket work zone during any movement of the bucket.

The backhoe operator said another work method was to remove logs by hand from the timber pile edge and cut them by chainsaw. He said the backhoe front bucket was then used to carry the cut logs to the two stockpiles created by Mr Slessor.

Supervisor did not inspect the work

The Supervisor said he did not physically inspect the work activity of cutting the logs by Mr Slessor on Saturday 23 August 2008.

The Supervisor said he later became aware that the log collection activity had actually taken place on the Saturday during a conversation he had with the backhoe operator on the morning of Sunday 24 August 2008.

Following the incident I&I Investigators examined and photographed two cut log timber piles that had been created by Mr Slessor on Saturday 23 August 2008.



The photo shows one of the two cut log stockpiles created by Mr Slessor on Saturday 23 August 2008

The stockpile was located approximately 80m from the incident site.

Photo date 26/8/08

Other timber taken from the site

The backhoe operator said that he had personally collected three loads of firewood in two years from CVO site before the incident.

He collected the logs from another location and Mr Slessor was not involved in this activity. The backhoe operator said he obtained verbal approval from his supervisor to remove the collected timber.

Mr Slessor's activities before the incident

Mr Slessor left the CVO front gate at 6:32pm on Saturday 23 August 2008. He arrived back at the electronic CVO front gate at 6:32am on Sunday 24 August 2008.

The Mine Services crew met with the Supervisor and were allocated the days tasks.

CVO electronic records indicate that Mr Slessor operated a 30 tonne excavator up until 11:25am at the North Tailings Dam, along with a dozer operator.

Mr Slessor, the dozer operator and the mine services crew all met together for lunch.

Mr Slessor and the dozer operator went back to the north tailings dam to continue work. At about 3pm Mr Slessor was collected by the backhoe operator to go to the south waste dump cleared area apparently for the purpose to dig test holes.

The backhoe operator said he collected the backhoe machine and noted that Mr Slessor had filled in the pre-start book for the backhoe. He then drove the backhoe to the area where he and Mr Slessor had been collecting timber logs the previous day.

Mr Slessor drove himself to the site in a CVO light vehicle. The backhoe driver first saw Mr Slessor walking near a pile of timber so he drove and parked the backhoe near where Mr Slessor was located.

The supervisor and another backhoe operator were driving in a CVO light vehicle in the vicinity of the South Waste Dump cleared area to inspect test hole sites as the operator was going to continue digging test holes the next day. They were not in visual sight of the area occupied by Mr Slessor and the backhoe operator.

The incident and what immediately followed

Sometime between 4pm and 5pm on Sunday 24 August 2008 Mr Slessor arrived at the incident site while the backhoe operator arrived with the backhoe.

Rather than dig test holes as required by CVO, they continued with timber log collection for the personal use of Mr Slessor.

The backhoe operator said he first set up the backhoe with the excavator bucket closest to the timber pile and opened the back cabin window so he could communicate with Mr Slessor. Mr Slessor said he would obtain a sling.



The photo shows the backhoe position in relation to the pile of wood.

Photo date 25/8/08

Mr Slessor walked away from the backhoe carrying a green rope back to the light vehicle apparently to obtain a sling.

At the same time the backhoe operator began setting up the backhoe and using the teeth of the excavator bucket to apply energy to lever out the incident log.



The photo shows a green rope and a chainsaw found in the tray of a CVO vehicle allegedly used by Mr Slessor.

At the time when the photo was taken the vehicle had been relocated from the incident scene to the CVO main office.

Photo date 24/8/08

While applying energy to the log the backhoe operator saw Mr Slessor walking in from the left hand side of the backhoe. He then saw the log come out from the wood pile and fall to the ground in front of the bucket.



The photo shows the view from the backhoe seat position showing the relation of the log pile, the backhoe bucket and the incident log on the ground.

Photo date 26/8/08



The photo shows the left hand side view from inside the backhoe cabin.

The incident log stump end is visible on the ground.

Photo date 26/8/08

The backhoe operator said he first saw the feet of Mr Slessor beside the backhoe. The backhoe operator put the bucket to the ground and got out of the cabin.

Mr Slessor was observed with his head trapped under the root ball of the log and lying on the right hand side of his body.

The backhoe operator lifted the log then rolled Mr Slessor onto his left hand side and into the recovery position.

Mr Slessor appears to have been wearing a helmet at the time of the incident which appears to have been knocked from his head by the impact and observed by the backhoe operator a distance from Mr Slessor's location.

The helmet shows no major structural damage. However, it was covered with a significant blood stain. An explanation for the blood stain was provided by the backhoe operator as he said he had initially retrieved and placed the helmet under Mr Slessor's head for support. He also observed blood coming from Mr Slessor's mouth, nose and left ear.

The backhoe operator then returned to the backhoe cabin and made a radio call for assistance. The backhoe operator found a jacket in the CVO vehicle which was then used to replace the helmet being used to support Mr Slessor's head.

The backhoe operator remained with Mr Slessor a short period of time until the supervisor arrived at the incident scene.

The supervisor and passenger whom were in the locality of Rodds Creek Dam drove to the incident scene on receiving the call from the backhoe operator. They saw the backhoe operator holding Mr Slessor's head, and that the backhoe bucket was on the ground.

CVO rescue personnel also responded to the incident and the first rescue person arrived at the scene and logged his arrival by radio at 5:22pm. Rescue personnel observed Mr Slessor lying on the ground on his left hand side and assisted in the recovery of Mr Slessor from the scene.

Mr Slessor was transported a short distance on a dirt track to a Air Ambulance helicopter which transferred Mr Slessor to Westmead Hospital.

The investigation of the scene by Industry and Investment NSW Inspectors saw bucket teeth marks and ripped bark on the middle section of the incident log. The marks observed on the log were consistent with the account that has been provided.



The photo shows the marks and ripped bark on the incident log in relation to the backhoe bucket.

Photo date 24/8/08

The findings

No barrier to prevent entry into activity zone	<p>Mr Slessor was in the operating zone of the backhoe while energy was being applied to the incident log.</p> <p>The root ball of the log which ultimately struck Mr Slessor was located within the swing arm radius of the operating backhoe.</p> <p>No physical barriers or delineation markings prevented or warned Mr Slessor as he entered the operating zone of the backhoe.</p>
Training of Mr Slessor	<p>CVO provided evidence of Mr Slessor's training records. These records showed Mr Slessor had undertaken training elements related to the activity of collecting logs.</p> <p>Relevant training documentation included;</p> <ul style="list-style-type: none">• Chainsaw operator cross cut training dated 21 March 2005• CVO "barricade and cone procedure" training dated 24 February 2004• CVO "apply the risk management process" training dated 27 January 2004• CVO authorisation to operate and train other CVO persons on a Caterpillar 330L excavator dated 15 February 2006
Operator held Workcover certificate but CVO training authorisation had expired	<p>The backhoe operator involved in the incident held a current Workcover certificate to operate backhoe type equipment.</p> <p>CVO training records showed that the backhoe operator passed the theory assessment to operate the incident backhoe on 8 March 2008. However the 3 month training authorisation permit to continue operating the backhoe expired on 9 July 2008.</p> <p>The backhoe operator held CVO authorisation to operate other mining equipment on the CVO site including wheel dozer, bulldozer, excavator, loader and face hydraulic shovel.</p> <p>Other relevant CVO training records for the backhoe operator included;</p> <ul style="list-style-type: none">• CVO "barricade and cone procedure" training dated 1 March 2004• CVO "apply the risk management process" training dated 10 December 2003

No evidence of plant failure	<p>The backhoe involved in the incident was owned by an equipment hire company and was on permanent hire to CVO.</p> <p>Post incident testing of the backhoe could not identify any operational malfunction that might have caused the incident.</p>
No evidence of inadvertent movement of the backhoe	<p>The backhoe operator said that the backhoe operated as intended.</p> <p>The backhoe operator said he was operating the backhoe excavator bucket from within the operator cabin, while seated and facing in the direction of the activity undertaken. The backhoe was stationary and the rear drive wheels lifted from the ground by the hydraulic stab jacks.</p> <p>No evidence was found that an inadvertent or unplanned movement of the backhoe caused the incident.</p>
Control of person to vehicle proximity (P to V)	<p>CVO had created a range of safe work procedures for the Terex backhoe including digging test holes deeper than 300mm in depth. Digging test holes was the task required by CVO to be undertaken at the site by Mr Slessor and the backhoe operator.</p> <p>The test hole SWP identified the following measures for the control of persons in proximity of the operating backhoe;</p> <ul style="list-style-type: none"> • <i>‘Ensure that no other person is in working range of the machine and remain alert to people entering the working range of the machine during operation.’</i> • <i>‘Always ensure the work area is correctly barricaded.’</i> • <i>‘Barricades and signs shall be installed to prevent unauthorised entry to the excavation’.</i> <p>The SWP relied on the backhoe operator being fully aware of the location of the offsider and the potential for the offsider to enter into the ‘no go zone’ of the backhoe.</p> <p>The SWP also required the CVO cone and barricade system to be in place. However, the cone and barricade system did not provide a physical barrier for the offsider assisting the task.</p> <p>Electronic proximity detection systems are developing for the mining industry. Retro-fit proximity detection systems can be fitted to machines to assist the operator with an audible/visual warning of unauthorised entry into machine ‘no go zones’.</p> <p>At the date of this report proximity detection systems are being developed for use on large mining equipment such as excavators, shovels and haul trucks. Currently it would be normal for smaller equipment on a mine site such as a backhoe not to be fitted with electronic proximity detection systems to detect unintended person to vehicle (P to V) interaction.</p>

No barriers to prevent entry into the work zone of the backhoe





There was no system of barrier cones or delineation tape being used in the immediate vicinity of the backhoe operation at the time Mr Slessor was injured.

CVO cone and bollard no entry system

The CVO cone and barrier system delineates the no entry zone to prevent unauthorised entry into the area.

The CVO system utilises differing coloured cones, delineation tape and varying access authorisation requirements for different types of tasks undertaken. The system required access authorisation from a nominated site supervisor.

Appendix B: Site Approved Cones and Bollards

Colour	Example	Purpose	Delineation Tape	Access Authorisation
Yellow		Used to delineate hazards assessed as LOW or MODERATE	Caution	Area Supervisor
Blue		Used to delineate plant and equipment maintenance areas*	Danger	Area Maintenance Supervisor
White		Used to delineate blasting, where explosives are being used and blast pattern**	Danger	Lead Shot firer
Red		Used to delineate hazards assessed as HIGH or EXTREME	Danger	Responsible Manager, Superintendent or Foreman

* Refer to ENG-3001 Isolation Standard for the management of blue maintenance cones during a Level 2 Isolation for the testing / commissioning of plant and equipment.

** Refer to CVO-OM-SWP-Blast Pattern Delineation for the positioning of white cones around a blast area.

IMPORTANT

A minimum of TWO cones or bollards shall be used to constitute a barrier.

CVO cone and bollard system at CVO.

The CVO system of coloured cones and bollards required operators to assess the appropriate system for the particular task and location.

During inspection of similar activities after the incident the Investigator noted that offsiders who were engaged in the work task were permitted to be inside the delineated zone. In this circumstance the offsider potentially could come in close proximity to the operating machine.

The offsider located inside the delineated zone is at increased risk of injury if positioned in the 'no go zone' of operating equipment.

Line of visual sight or other form of communication between the machine operator and the offsider is required to be effective to maintain 'no go zone' control.

The cone and bollard system did not require specific 'no go zones' of the operating machine to be marked.



The photo shows a construction zone using mesh barrier tape erected around an operating excavator at CVO site.

Photo date 3/12/08



The photo shows yellow coloured cones placed around an operating backhoe at CVO site.

Photo date 3/12/08



The photo shows yellow coloured cones placed at the rear of a mining excavator at CVO site.

Photo date 3/12/08

It was observed at CVO that equipment maintenance tasks required increased entry zone control measures than for operational equipment at the site.

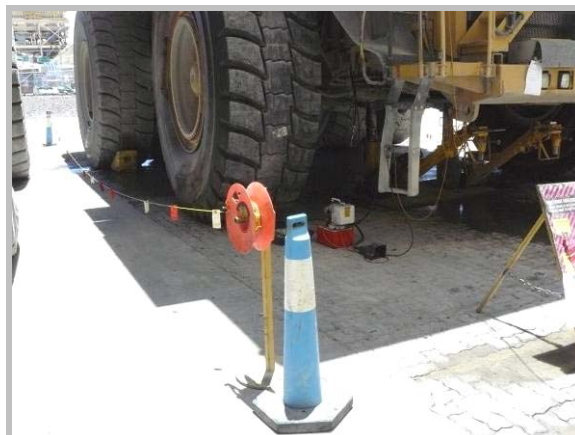
The maintenance entry zone control measures included;

1. Blue coloured cones
2. Area rope marking
3. Signage boards that required a person to provide verbal radio call notification before entering the work zone
4. Notice boards which held machine isolation locks and tags, sign on documentation required to be completed before a person entered the work zone and JSEA documents.



The photo shows a machine under maintenance control with blue coloured cones and radio notification signage board in place.

Photo date 3/12/08



The photo shows a haul truck under maintenance control with blue coloured cones, rope barrier and a notice board in place.

Photo date 3/12/08



The photo shows the notice board placed for a maintenance task.

Attached were machine isolation lock and tag and personnel sign on documentation.

Photo date 3/12/08

The investigation identified other tasks concerning person to vehicle (P to V) proximity detection. Identified tasks included offside's interacting with backhoes undertaking poly pipe line tasks.

Visual line of sight used between backhoe operator and Mr Slessor

CVO had SWP documents for personnel communication when using the Terex backhoe. Information provided in the SWP included;

- *'Two way radio communications using the two way radio channel 6'*
- *'Hand signals are only to be used where two way radio contact cannot be established'*
- *'Prior to hand signals being used as a form of communication all parties involved in the task or instruction must agree to the type of hand signals to be used and their implied instruction or meaning'.*

CVO provided two-way radio equipment to enable communication between equipment operators and other persons.

However, Mr Slessor and the backhoe operator did not use two-way radio communication for the task of accessing and cutting timber logs on the Saturday or Sunday.

The backhoe operator said he relied on a visual line of sight for his awareness of Mr Slessor's location during the activity.

It was noted during post incident testing of the backhoe located at the incident scene that mine two way radio communication was able to be established between persons at the backhoe and persons in a light vehicles approximately 80m from the backhoe.

CVO safety management system documents not used

CVO safety management system required the operator to conduct an assessment before commencing the task. The CVO system of assessment was called 'See, Stop, Control' (SSC).

CVO operators were provided with a pocket sized SSC hazard report form booklet.

The SSC required the operator to ask and assess the following matters;

- *'Is the task new'*
- *'Is anything different'*
- *'Has anything changed since you last performed the task'*
- *'Are there any conditions present that will prevent you from following the SWP/JSEA'*
- *If so – See, Stop, Control.*
 - *'Describe the task'*
 - *'List the hazards'*
 - *'List the controls'*
 - *'Assess the risk'*
 - *Describe what is next. Apply the controls- is it safe to proceed with the task? Are additional controls required?*

There was no evidence that SSC documents for the task of accessing, cutting and removal of timber logs had been created by Mr Slessor or the backhoe driver.

Supervisor unaware of altered system of work for the activity

Mr Slessor's immediate Supervisor was aware that he was obtaining logs for personal purposes.

The Supervisor was not aware that the system of work had altered from what had been earlier discussed with Mr Slessor.

The system of work was changed with the direct use of the backhoe to actively remove timber from the wood piles.

The Supervisor did not inspect the activity so was not aware that CVO safety management systems, such as 'See, Stop, Control' documentation and cone and barrier procedures, were not in place.

Supervisors more senior to Mr Slessor's Supervisor were present at CVO on the day of the incident; however they said they were unaware of the specific activity related to collecting the timber logs by Mr Slessor and the backhoe operator.

CVO mine safety management system external site compliance audit

CVO OHS management system structure included the Mine Safety Management Plan (MSMP). The MSMP held the relevant documentation procedures for tasks Mr Slessor and the backhoe driver were undertaking.

The CVO MSMP had been externally audited on 9 March 2007.

The external audit reviewed CVO MSMP documents, conducted inspections and interviewed site personnel.

Previous incident involving Mr Slessor identified issues with mine safety management system

Mr Slessor received a 500 volt electric shock at CVO on 25 September 2007. The incident occurred when Mr Slessor was using a hand shovel to dig around a service pit whilst standing in water. The electrical power to the area was switched on by another person and energised the electrical cables in the service pit.

The CVO internal investigation report highlighted organisational failures as persons failed to follow electrical energy permit procedures. Supervisory failings were identified as contributory to the incident. Other contributory factors identified were; inadequate CVO policy procedures and guidelines and no risk assessment undertaken. The investigation identified that excavation permits were not properly communicated to personnel.

The investigation by I&I NSW of Mr Slessor's incident involving the backhoe on 24 August 2008 identified similar organisational failings to the electric shock incident in 2007.

The relevant issues identified in 2008 incident included;

1. Operators not adhering to CVO MSMP procedures.
2. Identification and control of risks associated with the task.
3. Supervisory control of the task.

Actions taken after the incident

Actions taken by Industry and Investment NSW

I&I NSW officer's attended the scene and issued investigation notices on NML to preserve the scene and requirements to inspect and test the incident backhoe and to provide information related to the testing conducted.

NSW Police officers also attended the scene and were accompanied by I&I NSW officers and CVO representatives.

Safety Bulletin SB 08-08 published

Incident factors identified by I&I NSW were included in a safety bulletin published to industry.

I&I NSW published a Safety Bulletin (SB 08-08) dated 3 November 2008 titled Mineworkers-injured-in-machinery-crush-zones which included details of Mr Slessor's incident and other similar incidents and made recommendations to industry.

The safety bulletin identified issues of concern including:

- *Failure of risk assessments to identify and control risky behaviour of persons in and around machinery*
- *Failure of plant operators and supervisors to identify and control risky behaviour of persons in and around machinery*
- *Failure to establish and maintain no-go zones, control zones and barricading around machinery*
- *Failure to maintain line of sight, and communications with persons working around mobile plant and machinery.*

Industry reported incident review undertaken

A review was undertaken by the Investigation Unit of reported incidents in the NSW mining industry for the period four years prior to August 2009 involving backhoes and excavators.

The incident review identified recurring causative factors involving the use of backhoes and excavators.

**Safety
Bulletin
SB 09-04
published**

As a result of the review I&I NSW published a Safety Bulletin (SB 09-04) dated 15 September 2009 titled Human-interaction-with-backhoes-and excavators. The safety bulletin included further detail related to Mr Slessor's incident.

The bulletin identified issues of concern including:

- *Statistical incident data collected by Industry & Investment NSW in the four years to August 2009 identifies significant numbers of the incidents reported related to backhoe and excavator operations.*
- *Analysis of the incidents has indentified that serious bodily injury was an outcome due to human interaction in and around the work zone of backhoes and excavators.*
- *There were approximately 73 reported incidents involving backhoe and excavator-type equipment (not including fires on the machine).*
- *Nineteen of the incidents resulted in injury to either the operator or a person in the vicinity of the backhoe or excavator.*
- *The injuries were significant including one fatality, a person with multiple skull fractures resulting in brain injury and persons receiving fractures to the spine, pelvis and arms and crush injuries*

**Actions taken
by the mine
operator**

On 2 September 2008 CVO created a significant incident alert (SIA) related to the incident for internal distribution within NML.

The SIA communicated to personnel that a job safety and environmental analysis (JSEA) and job hazard analysis (JHA) or 'See, Stop, Control' (SSC) must be completed if no formal procedure for a task existed.

CVO said that the SIA was communicated at CVO at 'positive attitude safety' (PASS) meetings, mining open cut training days and discussions with persons onsite at CVO.

Following inspection and testing of the incident backhoe on 8 September 2008, NML required the backhoe owner to replace the broken left hand tail light and to relocate the emergency stop button on the rear of the backhoe that potentially may have been damaged by the swing arm of the excavator bucket.



The photo shows the damaged emergency stop button located near to the swing arm of the backhoe bucket.

Photo date 27/8/08

During December 2008 a mobile repeater station was installed to improve radio communications in the tailings dam area of CVO.

**CVO
corrective
action review
of the I&I
NSW Safety
Bulletin
SB 09-04**

CVO provided a review of the corrective actions undertaken by the company in relation to the matters addressed in the I&I NSW safety bulletin (SB 09-04) dated 15 September 2009 titled Human-interaction-with-backhoes-and excavators.

CVO identified the following actions had been undertaken:

- JSEA developed in addition to existing Standard Operating Procedure for using excavators/backhoe to assist in joining poly pipe
- Management structure in tailings dam area changed.
- Contract earthworks group included in wider open cut pre start planning meeting
- Elevated focus on 'see stop controls' risk assessment approach to tasks
- Site safe actions revised to confirm existing backhoe procedure maps to AS 1418.8-2002 Part 8 (use of backhoe as a lifting device)

**Supervision of
mine service
crews
increased**

CVO have identified alteration to supervisory arrangements for the two mine service crews. At the date of the incident the two mine service crews (4 to 5 persons in a crew) were being supervised by a leading hand for each crew.

The leading hands were supervised by the Mining Open Cut Production Supervisors.

The Mining Open Cut Production Supervisors were supervised by and reported to the Open Cut Production Superintendent.

In addition to the supervision provided to the mining service crews leading hands by the Mining Open Cut Production Supervisor a CVO employee has been made responsible for the supervision of the tailings dam work crew and provides oversight and technical guidance for the two mine service crew leading hands.

The new CVO supervisory position reports directly to the Open Cut Production Superintendent.

Conclusion

At about 5:00pm on Sunday 24 August 2008 at the Cadia Valley Operations, South Waste Dump extension area Bruce Slessor, an employee of Newcrest Mining Limited, received serious head injuries when struck by the root ball end of a tree log that was being levered out from a pile of felled scrub timber by a backhoe bucket.

Mr Slessor was in the operating zone of the backhoe whilst the machine was applying energy to lever out the timber log.

The timber collection was for the personal use of Mr Slessor.

The incident showed that the activity was not adequately planned to identify possible risks, apply appropriate risk controls and in particular did not prevent Mr Slessor from entering the operating zone of the backhoe.

It was identified that the documented safe work procedure relied on the machine operator ensuring that the offsider involved in the task remained outside of the 'no go' zone of the machine.

There were no hard barriers to provide warning or prevent entry of the offsider into the machine 'no go zone'.

The incident also showed that company personnel were allowed to carry out non-work related activities in a remote site location without adequate supervision to ensure compliance with site procedures.

Relevant published reference material

I&I NSW Safety bulletin SB 08-08	http://www.dpi.nsw.gov.au/minerals/safety/safety-bulletins/safety-bulletins-2008 SB08-08-Mineworkers-injured-in-machinery-crush-zones
I&I NSW Safety alert SA 08-11	http://www.dpi.nsw.gov.au/minerals/safety/safety-alerts SA08-11-Worker-crushed-by-sliding-backhoe
I&I NSW Safety bulletin SB 09-04	http://www.dpi.nsw.gov.au/minerals/safety/safety-bulletins/safety-bulletins-2009 SB09-04-Human-interaction-with-backhoes-and excavators
I&I NSW Safety Management Program	Small Mines Safety Management Kit (version 3)
I&I NSW MDG 5004	C.J. Pitzer Report A study of the risky positioning behaviour of operators of remote control mining equipment
Relevant Workcover guidance material	Work Cover Code of Practice 2002 Safety in Forest Harvesting Operations WorkCover Guide 2003 - 6th edition – Dogging WorkCover Guide 2005 - 2nd edition - Rigging
Relevant Australian Standards	AS 4801:2001 Occupational Health and Safety Management Systems –Specification with guidance for use AS 4360:2004 Risk Management AS 2294.1 Supp 1 – 2003 Earthmoving machinery – protective structures